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4D Magnetic Resonance Velocimetry in a 3D printed brain aneurysm OMID AMILI, University of Minnesota, DANIELE SCHIAVAZZI, Stanford University, FILIPPO COLETTI, University of Minnesota — Cerebral aneurysms are of great clinical importance. It is believed that hemodynamics play a critical role in the development, growth, and rupture of brain arteries with such condition. The flow structure in the aneurysm sac is complex, unsteady, and three-dimensional. Therefore the time-resolved measurement of the three-dimensional three-component velocity field is crucial to predict the clinical outcome. In this study magnetic resonance velocimetry is used to assess the fluid dynamics inside a 3D printed model of a giant intracranial aneurysm. We reach sub-millimeter resolution while resolving sixteen instances within the cardiac cycle. The physiological flow waveform is imposed using an in-house built pump in a flow circuit where the cardiovascular impedance is matched. The flow evolution over time is reconstructed in detail. The complex flow structure is characterized by vortical and helical motions that reside in the aneurysm for most part of the cycle. The 4D pressured distribution is also reconstructed from the velocity field. The present case study was used in a previous CFD challenge, therefore these results may provide useful experimental comparison for simulations performed by other research groups.

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